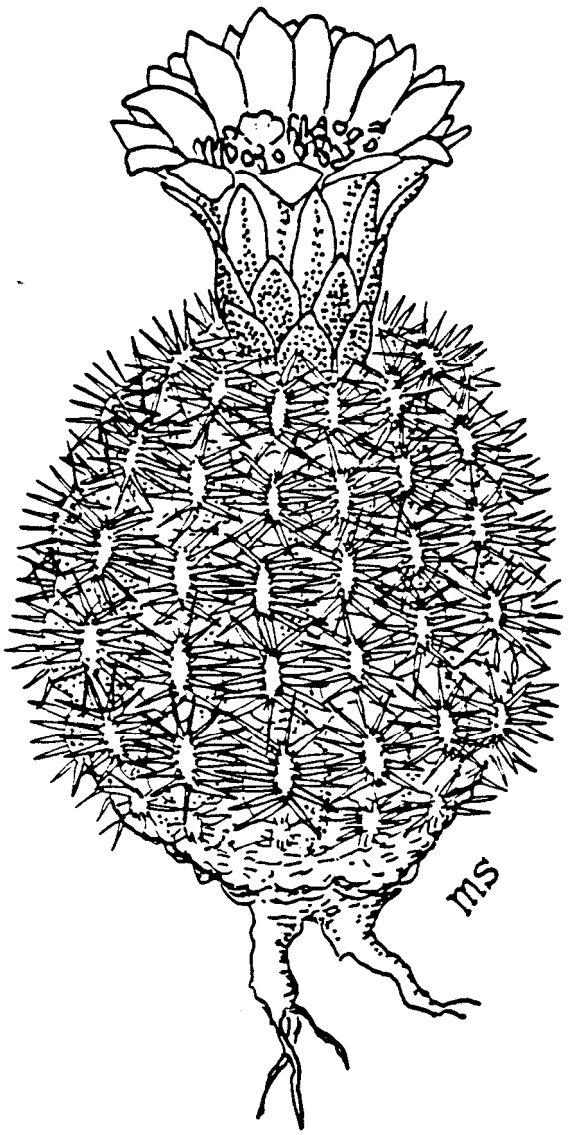
BRADY PINCUSHION CACTUS

(Pediocactus bradyi)

RECOVERY PLAN



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RECOVERY PLAN FOR THE BRADY PINCUSHION CACTUS

Pediocactus bradyi L. Benson

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DISCLAIMER

This is the completed Brady Pincushion Cactus Recovery Plan. It has been approved by the U.S. Fish and Wildlife Service. It does not necessarily represent official positions or approvals of cooperating agencies and it does not necessarily represent the views of all individuals who played a key role in preparing this plan. This plan is subject to modification as dictated by new findings and changes in species status and completion of tasks described in the plan. Goals and objectives will be attained and funds expended contingent upon appropriations, priorities, and other budgetary constraints.

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SUMMARY

1. GOAL: To remove Pediocactus bradyi from the Federal list of endangered and threatened species by managing and protecting the essential habitat of the existing populations and decreasing collection pressure.

2. RECOVERY CRITERIA: The criteria for downlisting of the Brady pincushion cactus to threatened status is permanent protection of 75 percent of the known habitat according to the steps outlined in this plan. The downlisting criteria will be reevaluated for adequacy upon attainment. The criteria for delisting cannot be established now. It is only after a complete census of plants within the known habitat and other necessary studies are conducted that quantification of criteria for delisting can be established.

3. RECOVERY ACTIONS: Major steps needed to meet the recovery criteria include: management of ORV use, livestock grazing, and mining within habitat of populations on Federal lands; inventory for new populations of P. bradyi; monitor and study existing populations; and development of a cactus trade management plan for all cacti.

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PART I. INTRODUCTION

Brief Overview

Pediocactus bradyi L. Benson, the Brady pincushion cactus, was listed as endangered on October 26, 1979 (44 FR 61784). Two other members of the genus in Arizona, P. peeblesianus (Croizat) L. Benson var. peeblesianus and P. sileri (Engelm.) L. Benson are also listed as endangered. Five species, P. despainii Welsh and Goodrich; P. papyracanthus (Engelm.) L. Benson; P. paradinei B.W. Benson; P. winkleri Heil; and P. peeblesianus (Croizat) L. Benson var. fickeiseniae L. Benson are in the 1980 Notice of Review and its 1983 supplement (45 FR 82480, 48 FR 53640) as candidates for future listing under the Endangered Species Act. These pediocacti are narrow endemics, each occupying distinctive restricted habitats on the Colorado Plateau. Considered by Benson (1962c) to be the "keystone of the arch" in reclassifying the cactus genera of the United States, Pediocactus and a few other small genera are intermediate between Echinocactus and Coryphantha and Mammillaria.

Pediocactus bradyi is known from a geographical area of about 70 km2 (17,000 acres) in Coconino County, Arizona. The species was first discovered in 1958, and since then, there has been a marked reduction in the number of plants due to collecting and other factors. Without management and protection of this rare cactus, eventual loss of its restricted gene pool and eventual decline and extinction will result.

The objective of this recovery plan is to outline a means for facilitating the recovery of Pediocactus bradyi by managing and protecting the existing populations and by decreasing the collection pressure on its populations in the wild to a level where the species can be removed from endangered status. This plan incorporates recommendations on protection, management, and research from scientists, resource managers, and laymen over the past four years.

In addition, this plan provides background information on the status of the Brady pincushion cactus, including consideration of past and present distribution and abundance, taxonomic relationships, habitat requirements, conservation and research efforts, and threats to the populations. A detailed outline of factors which are necessary for the recovery of P. bradyi follows in the format of a step-down outline. The Narrative section provides more information on the measures or actions necessary to counteract the threats to P. bradyi. The Implementation Schedule lists each task with a priority rating, the agencies involved, and the costs. This plan is developed for a 5-year period, and is subject to periodic revision.

Taxonomy

In 1961-1962, Lyman Benson combined into the genus Pediocactus (including P. bradyi) species that formerly were distributed over six different genera

due to their great diversity in spination, body proportions, and flower color. Benson recognized an overriding similarity; the structure and method of dehiscence of the fruits (dry at maturity and dehiscent usually both by a dorsal slit and by a ring around the circumscissile apex), as well as several other common characteristics (Benson 1962c).

Pediocactus bradyi is a small, semiglobose cactus with one (occasionally more) stems up to 6 cm tall and 5 cm in diameter. Its areoles are elliptic and densely white or yellow-villous. There are usually no central spines, but each areole has 14-15 whitish radial spines, each 6 mm long and spreading nearly pectinate. The straw-yellow flowers are about 2.5 cm in diameter. The green top-shaped fruit turns brown at maturity. During the dry season, the plants largely retract into the soil.

Pediocactus bradyi can readily be distinguished from its closest relative, P. winkleri, by the latter's peach-colored flowers and fewer spines (mostly g-11). Also, the radial spines of P. winkleri are less pectinate than those of P. bradyi.

Current Status of Pediocactus bradyi

A status report (Phillips et al. 1979) was prepared on P. bradyi; therefore, some of this discussion will be taken directly from this source.

Past and present distribution and abundance

Pediocactus bradyi was discovered in 1958 and named in 1962. Its known distribution has been expanded slightly around the area of its original discovery. Historically, it might have occurred northeast along the Colorado River, but Glen Canyon Dam (completed 1963) and the filling of Lake Powell behind it, would have destroyed any populations that might have occurred there (Heil et al. 1981).

Major L.F. Brady first collected this cactus in July 1958 and gave two living specimens to the Museum of Northern Arizona and one to W.H. Earle (Desert Botanical Garden). The specimens at the Museum of Northern Arizona died without blooming (McDougall 1962), and were deposited in the herbarium.

Mr. Earle showed the living plant to Lyman Benson [further information regarding trips to locate plants is given by Earle (1962)]. Lyman and Evelyn Benson visited the approximate locality of original collection on April 21, 1961, located plants, and described the new species in honor of Major Brady (Benson 1962a and 1962b). Additional descriptive information is provided in Benson (1962c, pp. 167-168).

Pediocactus bradyi grows on benches and terraces in the Navajoan Desert on the Colorado Plateau near the Marble Canyon of the Colorado River, Coconino County, northern Arizona (Benson 1962a). Pediocactus winkleri, its closest relative, is a recently described species from the hills of the Navajoan Desert in Wayne County, Utah. Thus, P. bradyi is isolated from P. winkleri by a distance of 175-200 kilometers (Figure 1).

Pediocactus bradyi grows on the plateaus flanking both sides of the Colorado River, in the area of U.S. Highway 89A. This is an area that is about 23 km (15 miles) in length, north to south, and varies in width from 1.6 km (1 mile) to 4.58 km (3 miles). One population area is located in Glen Canyon National Recreation Area. Other populations occur scattered throughout the Colorado River area on Bureau of Land Management (BLM) lands and on private lands. It is also known to occur on the Navajo Indian Reservation (L. Benson pers. comm. 1979, C. May pers. comm. 1982) and depending upon the location of unsurveyed boundaries, may occur in Grand Canyon National Park lands on the rim of Marble Canyon. Further studies are needed to determine the approximate numbers of individuals in the various populations.

As refinement of techniques to pinpoint the habitat are being made, new populations are being identified. Total estimated abundance may approach 10,000 plants, distributed in very local, discrete populations (C. May pers. comm. 1982).

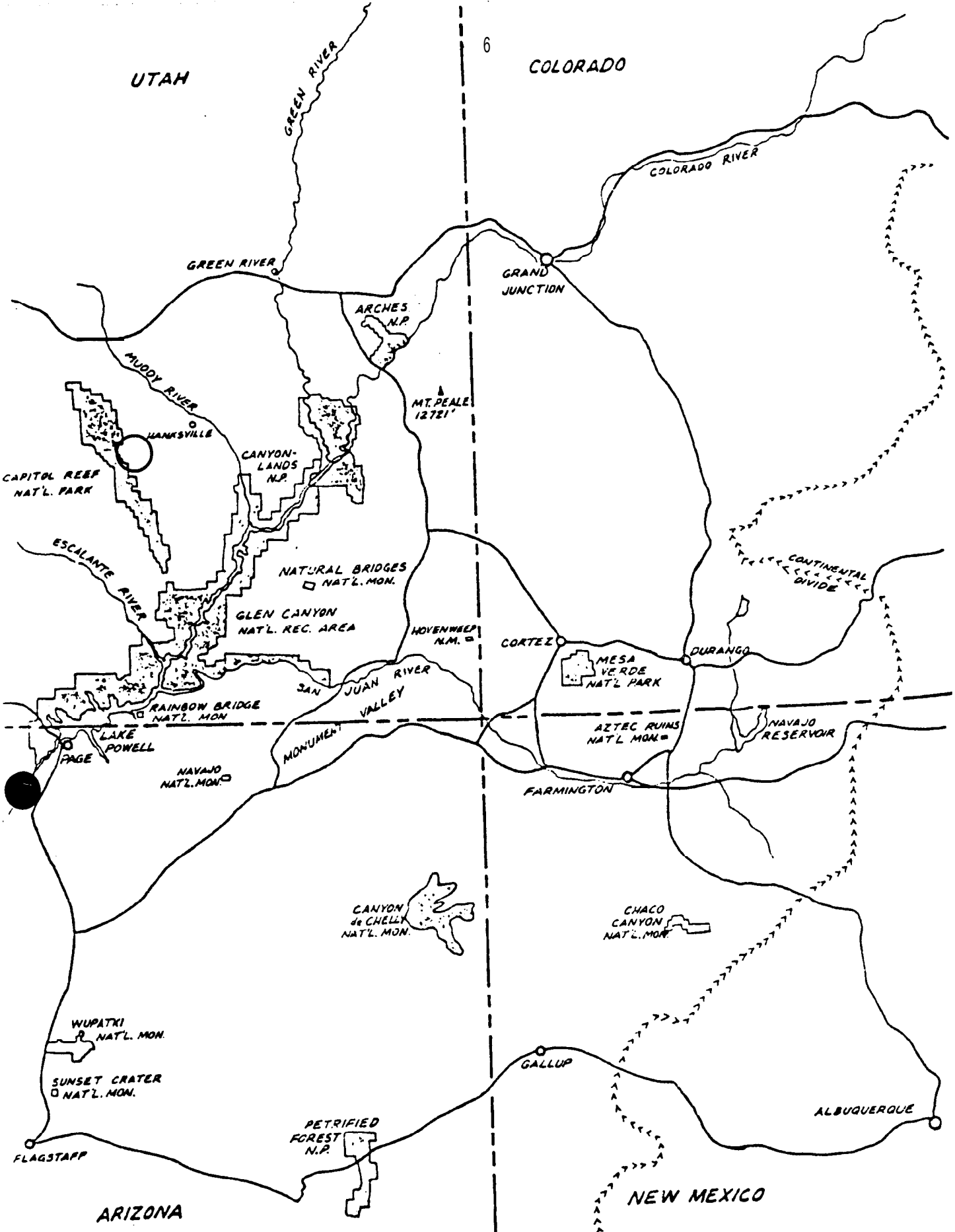

Figure 1. General distribution map of Pediocactus bradyi and Pediocactus winkleri

● Pediocactus bradyi

○ Pediocactus winkleri

Habitat

Pediocactus bradyi grows in the restricted habitat of Kaibab limestone chips overlying soil derived from Moenkopi shale and sandstone outcrops. Chert and quartz pebbles eroded from the Shinarump member of the Chinle Formation are also present at some sites. The potential habitat in the Marble Canyon area is estimated to be 17,000 acres but within this area plants have been located on only 10-20% of the potential habitat that was searched. The exact edaphic requirements need to be determined to discover the reasons for its absence on apparently suitable habitat.

The cactus occurs between 1170-1360 m (3861-4488 feet), the elevation of the Kaibab Formation. The plants grow in gravelly alluvium on the gently sloping (o-10") benches, in exposed, sunny situations. The contact between the Moenkopi and Kaibab Formations is an erosion surface. The cliff-forming limestone members of the Kaibab Formation contribute to the walls of Marble Canyon. The Kaibab, Toroweap, Coconino, and Hermit Formations in Marble Canyon are exposed. To the east and northwest, Echo Cliffs and Vermillion Cliffs rise above the level of the plateau and expose the higher Moenkopi and Chinle Formations and Glen Canyon Group (Wilson et al. 1969).

Associated Species

The vegetation where Pediocactus bradyi grows is generally open and sparse, characterized by low shrubs, grasses, and annuals. The biotic community is the Great Basin Desert Scrub (Brown and Lowe 1980). The dominants are: shadscale (Atriplex confertifolia), snakeweed (Gutierrezia sarothrae), Mormon tea (Ephedra viridis), and desert trumpet (Eriogonum inflatum).

Impacts and Threats

The threats to Pediocactus bradyi include collection, off-road vehicles (ORVs), uranium mining, and livestock grazing. Natural factors, such as restriction of species to a localized soil type, restricted gene pool, etc., in conjunction with the human activities make the species more vulnerable to these impacts and threats.

A serious threat to Pediocactus bradyi is collection (taking). This cactus is in worldwide demand by collectors of rare cacti, and removal of plants from native habitats by both private collectors and commercial suppliers has occurred (L. Benson pers. comm. 1979, Newland 1979). There is a significant gap between the numbers currently available commercially as artificially propagated specimens and the numbers required to satisfy market demand (Fletcher 1979).

Illegal collection is having the greatest impact in areas where the populations are accessible from highways. The plants are most visible when flowering, at which time casual collectors can easily locate and collect them. Populations of this cactus are well known to collectors and easily accessible from the highway by dirt roads or cross-country hiking. Pediocacti are some of the most difficult cacti to grow from their own roots in cultivation (Heil et al. 1981). Thus, a constant need for wild plants as replacement stock occurs.

Seed collection can also be very detrimental. Research has shown that P. bradyi populations depend very heavily on current seed production because the plants are fairly short-lived (10-15 years). With an average of 25 seeds produced per plant, there are no surplus seeds for collection (Gibson and May 1981). In addition, damage to the apical meristem, which occurs due to carelessness or ignorance during seed collection, prevents the plant from flowering or fruiting again.

Within the historic range of Pediocactus bradyi some habitat has been destroyed and there is a danger of significant future destruction. An immediate threat to P. bradyi is destruction of the habitat and individual plants by off-road vehicles. Four-wheel drive vehicles in particular are causing considerable damage to the populations west of Marble Canyon (C. May pers. comm. 1982). These vehicles run over the plants, killing them by dislodging and

and crushing, or damaging their apical meristem so further reproduction is impossible. Also, the fragile rocky desert habitat is disrupted seriously so that potential sites for seedlings are destroyed and associated species are damaged or killed.

Uranium exploration and mining on the Arizona Strip present potential threats to Pediocactus bradyi. As of mid-1984, there were claims filed within five sections located near P. bradyi populations. The BLM has received plans for uranium exploration in suitable habitat for the cactus adjacent to one population. Uranium is found in collapsed tubes that have eroded out of the limestone at the edges of cliffs and breaks in side canyons to the Colorado River. Pediocactus bradyi habitat is just above such areas and would be heavily impacted by roads, buildings, and equipment used in the mining, if not totally destroyed by the mining process itself.

Cattle grazing in the area occupied by this plant adversely affects it. Trampling of the plants and habitat, especially during wet seasons of the year when the ground is muddy, and when the plants are emergent, is a definite threat on portions of the range which are administered by the BLM and private lands which are grazed. Sheep grazing causes the same or more serious impact on the Navajo Indian Reservation.

Natural factors that are affecting the continued existence of Pediocactus bradyi are its restriction to a unique and very localized soil type, its restriction to flat or gentle slopes in an area which has very dissected topography, its rather low population level with resultant restricted gene pool, and its restriction to a small geographic area. Pediocacti are subject to root rot (Heil et al. 1981) so this may be a factor in thinning the population during very wet years. Frost-heaving has also been proposed as a natural phenomenon taking its toll (Fletcher 1979). All of these natural factors tend to intensify the adverse effects of the human-caused threats to the plants and their essential habitat.

Management and Conservation Efforts

The distribution of Pediocactus bradyi is reasonably well documented. Records of specific population sites have always been kept purposefully vague to protect the cactus from being taken by cactus collectors. However, some collectors know precisely where populations occur and have been systematically eliminating them (Gibson and May 1981, R. Fletcher pers. comm. 1982). Pediocactus bradyi is on the Arizona State protected list, Arizona Native Plant Law (ARS 3-901B). This prohibits its collection except by permit for scientific or educational purposes. On July 29, 1983, P. bradyi was placed on Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora, which requires permits from both the importing and exporting

countries before shipment may occur. Generally speaking, scientific trade benefitting the species' survival can be allowed, and trade for primarily commercial purposes is strictly prohibited.

The Endangered Species Act of 1973, as amended, prohibits the removal and reduction to possession from Federal lands of any plant listed under the provisions of the Act. For any listed plant, it is also prohibited for any person subject to the jurisdiction of the United States to import or export, deliver, receive, carry, transport, or ship in interstate or foreign commerce in the course of a commercial activity; or sell or offer to sell any listed plant. The Act also provides for the issuance of permits to carry out otherwise prohibited activities involving listed species under certain circumstances.

The Lacey Act, as amended in 1981, also provides some protection for the Brady pincushion cactus. Under this Act it is prohibited to import, export, sell, receive, acquire, purchase, or engage in the interstate or foreign commerce of any plant taken, possessed, or sold in violation of any law, treaty, or regulation of the United States, any Indian tribal law, or any law or regulation of any State.

Off-road vehicle designation

Populations of Pediocactus bradyi are known to occur on the Badger Creek, Cram, and Soap Creek allotments of the BLM Vermillion Resource Area.

Off-road vehicle (ORV) designations have not been made for these allotments by the BLM. Current BLM policy on ORV use is based on the rules and regulations published in the June 15, 1979, Federal Register (Vol. 33: 34834). One of the more pertinent regulations reads as follows:

> No person shall operate an off-road vehicle on public lands in a manner causing, or likely to cause significant, undue damage to or disturbance of the soil, wildlife, wildlife habitat, improvements, cultural or vegetative resources or other authorized uses of the public lands...,

ORV designation work is normally done as a part of the planning effort when it is identified as a management issue or concern. However, to prevent further damage, and remedy existing resource damage, BLM should erect signs along the access roads from U.S. Highway 89A requesting that users remain on existing roads and trails.

Range situation

The four BLM allotments in which Pediocactus bradyi occurs or is likely to occur are Badger Creek, Soap Creek, Cram and Buffalo Tank. These allotments are addressed in recent BLM allotment management plans (AMP) developed by the Arizona Strip District (BLM 1979, 1982, 1983).

The Badger Creek AMP, as approved in 1982, allows eight cattle to be run yearlong on this allotment. Approximately 975 of the 5,876 acres of BLM

leased land in the Badger Creek Allotment is habitat for *P. bradyi*. The Badger Creek Allotment has been placed under less intensive management; therefore, a specific grazing formula and range improvements are not planned for this allotment. Two existing range improvements, a water trough and a water storage tank, are situated near two known populations of *P. bradyi* (BLM 1979).

The 1983 Soap Creek AMP combines the Lee's Ferry, Soap Creek, Cram and Buffalo Tank Allotments. The latter three allotments include habitat for *P. bradyi,* and will be addressed separately. The planned grazing systems will be implemented when the range improvements are completed.

The Soap Creek Allotment consists of four pastures. The 8,990 acres of P. *bradyi* habitat is restricted to the South Soap Pasture that has 22,500 Federal acres. This pasture will be treated as a winter pasture with grazing occurring from November 15 to June 30. Every other year 150 cattle will be in the pasture between November 15 and March 15. During alternate years 250 cattle will graze the pasture between March 16 and June 30. Every 2 years this pasture will receive 1 year of rest (BLM 1983). Two water troughs and a pipeline exist near known populations of *P. bradyi*. An additional reservoir and corral are located in habitat for the species. Three proposed range improvements will be located in such a manner as to avoid *P. bradyi* populations and habitat. They are South Fork catchment and trough and the North Canyon and South Fork fences.

All three pastures within the Cram Allotment contain habitat for P. bradyi. The Sand, Rider Point, and North Canyon Point pastures have a total of 22,560 Federal acres, 7,440 of which are habitat for P. bradyi. The planned grazing formula calls for two of the three pastures to be grazed every year between November 1 and March 15. During this period 300 cattle will be put into these pastures. Every year 300 cattle will graze the third pasture between March 16 and June 15. The grazing system will give each pasture a 1-year rest every 3 years (BLM 1983). Eight existing range improvements including reservoirs, water tanks, and a water trough are located in habitat for P. bradyi. One reservoir is situated in the immediate vicinity of two P. bradyi l a t i o n s .

Total acres of P. bradyi habitat in the Buffalo Tank Allotment have not been determined. Of the three pastures, only the Buffalo Pasture is likely to support populations of the species. According to the planned grazing formula, Buffalo Pasture will be grazed 2 out of each 3-year period between December 1 and June 15. During this 6.5 month period the cattle will be put into the two pastures as follows: 175 cattle from December 1 to March 31, 225 cattle from April 1 to April 30, and 330 cattle from May 1 to June 15. Every third year the Buffalo Pasture will be rested. The grazing system also allows for 100 cattle from the Lee's Ferry Allotment to be brought in during the winter.

This would be every third year when the total Lee's Ferry Allotment is rested (BLM 1983). Two existing range improvements, Marble Canyon Catchment and a reservoir, are located in habitat for *P. bradyi*. The improvements listed in the AMP for Buffalo Tank Allotment should not affect!. *bradyi*.

Grazing in all of the allotments will take place primarily during the wet season of the year between November and May. This is also the period in which *P. bradyi* is emergent and most vulnerable to the effects of trampling. Areas in the vicinity of water developments where cattle tend to concentrate are of particular concern. *Pediocactus bradyi* is not mentioned in either of the approved AMPs (BLM 1982 and 1983).

Monitoring

Three permanent transects were established in 1980 by BLM personnel within three populations of *P. bradyi* located on BLM administered land. The number of individuals, phenology, size and age classes, and evidence of physical damage to plants were recorded. Close-up and aspect photos were also taken, These transects were not reread until 1984 and at that time the trend of the marked *P. bradyi* was down. A new method has been established by BLM personnel to monitor the species every year from 1984 through 1987. The Fish and Wildlife Service (FWS) will work cooperatively with BLM to improve the management of this species through the development of a habitat management plan.

One study site in another population was established in 1979 by Clay May and has been read once annually thereafter (C. May pers. comm. 1984). Preliminary data have been obtained on such life history characteristics as frequency of seedling establishment, survivorship, fecundity, reproductive index, and impacts to the populations by humans and other animals. Evidence of significant damage to plants and habitat from ORV's and collecting has been obtained from this study.

Future monitoring efforts could include quarterly review of BLM mining claimant files and contact of claimants to inform them of the presence of endangered species in the area of their claim(s), and to encourage their cooperation for the conservation of the species.

Propagation

The Plant Resources Institute in Salt Lake City, Utah, has worked on the tissue culture propagation of several species of Pediocactus, under contract to BLM. Basically, the procedure involved placing meristematic tissue (seedling tips or areoles) in an agar-based medium and culturing for 6-8 weeks. The hormone levels were varied to achieve growth and multiplication. Usually by six weeks new buds had formed. These buds were removed and replated. The replating was continued until the desired number of plants was obtained. The young cultured cacti were allowed to root and then transferred from growth chamber to greenhouse.

The Plant Resources Institute developed a method for rapidly obtaining multiple propagules of P. paradinei, P. sileri, and P. papyracanthus; however, BLM is no longer funding this program. A system for the tissue culture propagation of P. bradyi has not been established. Additional research is needed to develop the appropriate culture medium for P. bradyi. Rooting techniques and transfer procedures for establishing small plants in soil need to be developed for all the pediocacti. Various botanical institutions have expressed an interest in acquiring and maintaining the plants from the Plant Resources Institute. It is possible that some of these same institutions would be interested in developing the propagation techniques for mass production of P. bradyi and the other pediocacti.

PART II. RECOVERY

Prime Objective

The prime objective of this recovery plan is to reduce taking from the wild and to manage and protect the essential habitat of Pediocactus bradyi so that healthy populations can be sustained in their natural habitat at a level where the species can be removed from the Federal Endangered Species List.

The criteria for downlisting to threatened status is permanent protection of 75 percent of the known habitat according to the steps outlined in this plan. The downlisting criteria will be reevaluated for adequacy upon attainment. The criteria for delisting cannot be established now. Funding levels have not allowed complete census of plants within the known habitat and it is only after necessary studies are conducted that quantification of criteria for delisting can be established.

Step-down Outline

1. Remove threats to Pediocactus bradyi by enforcement of existing regulations and management of the habitat for protection of the species.
    11. Cooperate with other Federal and State agencies to enforce existing regulations.

111. Erect signs to prohibit ORVs on Lee's Ferry Road.

112. Continue to enforce provision 3809.2-2d of the Surface Management of Public Lands, under U.S. Mining Laws and comply with Section 7 of the ESA.

113. Enforce existing collecting and trade regulations under ESA, CITES, Lacey Act, and State laws.

12 Develop management practices to protect the sites.

121. Put up Agriculture and Horticulture sign at Navajo Bridge and Lee's Ferry.

122. Maintain existing fences.

123. Remove and reclaim Arizona Department of Transportation gravel pullout west of Marble Canyon.

124. Work with BLM and the Navajo Nation to manage ORV use.

1241. Erect signs along access roads from U.S. Highway 89A that address ORV use in the area.

1242. Determine actual ORV use on BLM and Navajo lands and monitor populations to document the extent of damage to P. bradyi from ORV use.

125. Ensure that grazing does not impact populations of P. bradyi.

126. Develop a Habitat Management Plan (HMP) for P. bradyi habitat on BLM-administered land.

2. Sustain healthy populations in their natural habitat at the existing sites.

   21. Study the ecology of Pediocactus bradyi.

      211. Soils.

      212. Water.

      213. Biotic factors - study the relationship between the cactus and other organisms.

         2131. Herbivores.

         2132. Other organisms.

   22. Study the population biology of the cactus.

      221. Life history characteristics.

      222. Demographic trends - monitor population numbers to try to separate the effects of natural cycles from trends resulting from human impacts (collection, ORVs, etc).

   23. Inventory for Pediocactus bradyi.

      231. Search for other populations within the known area.

      232. Search for new locations.

3. Develop a comprehensive trade management plan (CTMP) for all cacti.

   31. Develop a trade study.

   32. Develop a monitoring study to determine the impact of collecting.

   33. Determine the feasibility of reducing the collecting pressure.

34. Develop a law enforcement strategy.

4. Develop public awareness, appreciation, and support for the preservation of Pediocactus bradyi.

5. Develop propagation techniques to provide nursery stock for possible reintroductions within its historic range.

51. Investigate various methods of propagation.

52. Consider greenhouse-grown stock for possible reintroduction within its historic range.

Narrative

1. Remove threats to Pediocactus bradyi by enforcement of existing regulations and management of the habitat for protection of the species.

   Because of the rarity of P. bradyi, all existing populations must be protected by the enforcement of existing regulations and management of activities threatening the species.

11. Cooperate with other Federal and State agencies to enforce existing regulations.

    National Park Service regulations regarding ORVs, BLM regulations regarding mineral development, as well as State regulations prohibiting taking of plants and Endangered Species Act regulations need to be enforced. Because the major serious threats to P. bradyi are collection and habitat destruction, enforcement of existing regulations are priority one tasks necessary to prevent the irreversible decline of the species.

111. Erect signs to prohibit ORVs on Lee's Ferry Road.

    Access to the river is limited to the main paved road and graded road in Glen Canyon National Recreation Area but ORVs do cut cross-country occasionally. Some signing and judicious placement of boulders would decrease this abuse.

112. Continue to enforce provision 3809.2-2d of the Surface Management of Public Lands, under U.S. Mining Laws, and comply with Section 7 of the ESA.

Uranium is a locatable mineral, subject to the January 1, 1981, regulations (45 FR 78902). Specifically under 3809.2-2d: "The operator shall take such action as may be needed to prevent adverse impacts to threatened or endangered species, and their habitat which may be affected by operations." This requirement applies to all operations including casual use, and operations under a notice and a mining plan of operations. The BLM should review mining claimant files and contact the claimants regarding the listed species. The Endangered Species Act (Section 7) requires Federal agencies to consult with FWS on any action which may affect listed species or their habitat.

113. Enforce existing collecting and trade regulations under ESA, CITES, Lacey Act, and State laws.

This plant is protected by ESA, CITES, Lacey Act, and the Arizona Native Plant Law. Pediocactus bradyi is listed as endangered under the Endangered Species Act and is on the Arizona State protected list, Arizona Native Plant Law (ARS 3-901B). Appendix I of CITES which includes P. bradyi, contains species believed to be threatened with extinction.

Generally speaking, scientific trade beneficial to the species' survival in the wild can be allowed; trade for primarily commercial purposes is strictly prohibited. Under the Lacey Act, it is unlawful to export, import, transport, sell, receive, acquire, or purchase any plant taken or possessed in violation of any law, treaty, or regulation of the U.S., of any Indian tribal law, or of any law or regulation of any State.

12. Develop management practices to protect the sites.

Actions elaborated below need to be taken to protect the known existing sites.

121. Put up Agriculture and Horticulture sign at Navajo Bridge and Lee's Ferry.

Navajo Bridge turnoff and Lee's Ferry are important tourist stops. Agriculture and Horticulture signs stating that the Cactaceae are protected by Federal law and that violators will be fined should be posted. These informative signs might deter some potential collectors.

122. Maintain existing fences.

Maintenance of existing fences, particularly those along the highway, is needed to control ORV use.

123. Remove and reclaim Arizona Department of Transportation gravel pullout west of Marble Canyon.

This highway gravel dump has destroyed some habitat of Pedio- cactus. Moving the gravel dump a mile or so south to the northwest side of the highway would eliminate the pullout for tourists and collectors; sighting and collecting cactus would be difficult without a convenient pullout.-

124. Work with BLM and the Navajo Nation to manage ORV use.

Off-road vehicle use should be controlled and monitored in the vicinity of known populations. Habitat destruction from ORVs is an immediate threat to P. bradyi; therefore, to prevent an irreversible decline of the species, this task has been given a priority one rating.

1241. Erect signs along the access roads from U.S. Highway 89A that address ORV use in the area.

ORV designations have not been made for the BLM-admin- istered land that P. bradyi inhabits. However, signs requesting that users remain on existing roads and trails need to be erected along the access roads.

1242. Determine actual ORV use on BLM and Navajo lands and monitor populations to document the extent of damage to P. bradyi from ORV use.

If an ORV closure is required to conserve the species on BLM land, a formal ORV designation will need to be pursued. This will involve preparation of a closure order, environmental analysis, implementation plan, and Federal Register notice.

125. Ensure that grazing does not impact populations of P. bradyi. Monitor populations in the vicinity of water developments, feeders, and other areas of concentrated livestock use. See task 222.

126. Develop a Habitat Management Plan (HMP) for P. bradyi habitat on BLM-administered land.

The HMP is the main management tool that BLM uses to conserve Federally listed species. The document would address further study and monitoring of the species and provide coordination between BLM and FWS on management decisions affecting the habitat and overall condition of the species on public lands. The planned actions in this document usually include recovery tasks assigned the BLM under the recovery plan. Without proper

management and protection, eventual decline and extinction will result. Therefore, this task has received a priority one rating.

2. Sustain healthy populations in their natural habitat at the existing sites.

Because of the rarity of Pediocactus **bradyi,** all existing populations must be sustained in a healthy and vigorous state. An in-depth knowledge of its ecology is needed to understand its habitat requirements. When these are known, they can be used to sustain healthy, natural populations.

21. Study the ecology of Pediocactus **bradyi.**

Studies on specific geological/edaphic parameters need to be done to determine factors influencing the exact distribution of the cactus. Both required components and limiting factors should be determined. This will provide an estimate of how much habitat there is and the type of management necessary.

211. Soils.

The depth of soil, amount and nature of limestone chips, slope, and microhabitat features should be analyzed to determine why seemingly identical areas have no plants. Soil factors such as chemical composition, texture, structure, aeration and temperature need to be assessed.

212. Water.

Plants are emergent in the spring for reproduction but during dry periods shrinking plants retract into the soil. Root rot is evident during extreme wet periods. Frost-heaving can uproot plants. The timing and amount of rainfall, with resulting moisture equivalence of the soil, at different seasons as well as the effect of the gravel rock cover on evaporation need to be determined.

213. Biotic factors - study the relationship between the cactus and other oraanisms.

2131. Herbivores.

Various potential herbivores, primarily rabbits and packrats, are abundant in the area. Rabbit droppings are common near the plants, and the concentration of plants at the top of cliffs makes them particularly vulnerable to foraging packrats which have dens immediately below among the boulders.

2132. Other organisms.

Soil organisms such as fungi and nematodes may play an important role in the ecology of the taxon, especially in relation to root rot. The relationships of pollinators and fruit eaters also need to be assessed.

22. Study the population biology of the cactus.

The life history characteristics of the Brady pincushion cactus should be studied because they reflect the species' adaptations to its particular environment. Some microhabitats allow higher fecundity and survivorship of individual plants than others, so characteristics of subpopulations can indicate which abiotic and biotic components are most essential to survival of the species. Monitoring plots have been established in four *P. bradyi* populations. One has been read once per year for four years. Continued reading of these plots and establishment of new plots in different microhabitats are needed to assess trends.

221. Life history characteristics.

The frequency of seedling establishment, survivorship, fecundity, density-dependence of plants related to pollination, and reproductive index of the species are some factors that need to be considered.

222. Demographic trends - monitor population numbers to try to separate effects of natural cycles from trends resulting from human impacts (collection, ORVs, etc.).

Natural populations are often cyclical in numbers. Overlying this natural variation can be the effects of environmental

perturbations induced by human impacts. Suitable sites for monitoring, i.e., transects and exclosures, include areas of concentrated livestock use, ORV use, and areas accessible to collectors. These studies should also include control sites.

23. Inventory for Pediocactus bradyi.

Final inventories are needed to map the exact range of the cactus, to determine if any populations have been overlooked, and to determine its rarity for management plans.

231. Search for other populations within the known area.

Some of the suitable habitat between the known populations may support plants at low densities.

232. Search for new locations.

Similar geologic outcrops and substrate occurring nearby (Grand Canyon National Park) should be searched, as well as areas across the Colorado River on the Navajo Indian Reservation. The Navajo Indian Reservation has never been intensively surveyed for P. bradyi.

3. Develop a comprehensive trade management plan (CTMP) for all cacti.

Prior to development of trade management strategies, studies are necessary to determine what species are in the trade, the overall trend of trade in

listed cacti, the feasibility of reducing the collecting pressure on the wild populations by promoting a commercial artificial propagation program and to determine strategies for effective implementation of law enforcement 'responsibilities of ESA, CITES, Lacey Act, and State laws. These studies should be national in scope and address all cacti. Completion of subtasks 31 through 34 will result in development of an FWS policy on the cactus trade problem and will allow the drafting of a CTMP.

31. Develop a trade study.

Documentation of the identity of species in the trade and their source is of primary concern to the development of trade management strategies. This would involve the investigation of the cacti dealers and catalogs, and interviews with knowledgeable individuals.

32. Develop a monitoring study to determine the impact of collecting.

Establish sample plots to monitor listed cacti and cacti suspected of being impacted by trade. Natural changes in populations as well as the success of recovery efforts would also be measured by the monitoring study. The impact of seed collecting, and taking of cuttings are needed to understand harvest limits on the species.

33. Determine the feasibility of reducing the collecting pressure.

A commercial artificial propagation program may remove some of the

collecting pressure on the cacti in the field. Some collectors enjoy raising their own plants from seeds or seedlings and if these are easily and economically available, then the collectors may not turn to field collecting. Other collectors only want field collected plants, so some pressure is likely to exist on the wild populations.

34. Develop a law enforcement strategy.

Evaluate issues involved in enforcing regulations regarding all listed cacti species. Special problems with listed cacti should be addressed in coordination with law enforcement to protect the species.

4. Develop public awareness, appreciation, and support for the preservation of Pediocactus bradyi.

Education of the public is a vital part of the recovery process. The cooperation of the public is essential for the ultimate success of the foregoing recovery measures. Public interest groups, especially local ones such as native plant societies, cactus societies, and The Nature Conservancy chapters need to be involved. The visibility of their support can be instrumental in shaping public opinion. Specific strategies would include lectures, pamphlets, letters etc., concerning conservation of threatened and endangered species.

5. Develop propagation techniques to provide nursery stock for possible reintroduction within its historic range.

The pressure of collecting on natural populations may be reduced by providing adequate supplies of propagated specimens for reintroduction into depleted habitat.

51. Investigate various methods of propagation.

These plants have proven difficult to grow, and methods must be developed for production. Evaluate the adequacy of the tissue culture propagation method, the cutting and grafting method and the seed germination method for mass production.

52. Consider greenhouse-grown stock for possible reintroduction within its historic range.

The severe reduction of natural populations in recent years may soon reduce them below the level of viability. Even if the cause for the loss can be found and corrected, reintroduction may be needed as a short-term recovery method. Proper precautions would be exercised to prevent genetic contamination.

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_____. 1962b. Letter to Major L.F. Brady, Feb. 1, 1962.

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PART III. IMPLEMENTATION SCHEDULE

The Implementation Schedule that follows is a summary of scheduled actions and costs for the Brady pincushion cactus recovery program. It is a guide to meet the objectives of the recovery plan for the Brady pincushion cactus, as elaborated upon in Part II, Narrative. This schedule indicates the general category for implementation (I = information gathering, M = management, A = acquisition, 0 = other), recovery plan tasks, corresponding action outline numbers, task priorities, duration of the tasks ("ongoing" means that once the task is begun it will be conducted on an annual basis), the agencies responsible to perform these tasks, and lastly, the estimated costs for FWS tasks. Part III is the action of the recovery plan, that when accomplished, should bring about the recovery of the endangered Brady pincushion cactus and protection of its habitat. It should be noted that monetary needs for agencies other than FWS are not identified and therefore Part III does not reflect the total financial requirements for the recovery of the species.

GENERAL CATEGORIES FOR IMPLEMENTATION SCHEDULES

Information Gathering - I or R (research)

1. Population status
2. Habitat status
3. Habitat requirements
4. Management techniques
5. Taxonomic studies
6. Demographic studies
7. Propagation
8. Migration
9. Predation
10. Competition
11. Disease
12. Environmental contaminant

Management - M

1. Propagation
2. Reintroduction
3. Habitat maintenance and manipulation
4. Predator and competitor control
5. Depredation control
6. Disease control
7. Other management

Acquisition - A

1. Lease
2. Easement
3. Management agreement
4. Exchange
5. Withdrawal
6. Fee title
7. Other

Other - 0

1. Information & education
2. Law enforcement
3. Regulations
4. Administration

RECOVERY ACTION PRIORITIES

1 = an action that must be taken to prevent extinction or to prevent the species from declining irreversibly.
2 = an action that must be taken to prevent a significant decline in species population/habitat quality, or some other significant negative impact short of extinction.
3 = all other actions necessary to provide for full recovery of the species.

ABBREVIATIONS USED

BLM - USDI Bureau of Land Management
FWS - USDI Fish and Wildlife Service
SE, Office of Endangered Species
LE, Law Enforcement
NPS - National Park Service
BIA - Bureau of Indian Affairs
AAH - Arizona Commission of Agriculture and Horticulture
ADOT - Arizona Department of Transportation
NN - Navajo Nation

PART III. IMPLEMENTATION SCHEDULE

GENERAL CATEGORY (1)	PLAN TASK (2)	TASK # (3)	PRIORITY # (4)	TASK DURATION (5)	RESPONSIBLE AGENCY FWS REGION (6)	RESPONSIBLE AGENCY FWS PROGRAM (6a)	RESPONSIBLE AGENCY OTHER (7)	FISCAL YEAR COSTS (EST.)* FY1 (8)	FY2	FY3	COMMENTS (9)
M3	Erect signs to prohibit ORVs on Lee's Ferry Road	111	2	Ongoing			NPS				
02	Continue to enforce provision 3809.2-2d of U.S. Mining Laws & comply with Section 7 of ESA	112	1	Ongoing	2	SE	BLM BIA NPS NN	1,000	1,000	1,000	
02	Enforce existing collecting & trade regulations under ESA, CITES, Lacey Act & State laws	113	1	Ongoing	2	LE	BLM BIA NPS AAH NN	2,000	2,000	2,000	
M3	Sign at Navajo Bridge and Lee's Ferry	121	2	1			AAH				
M3	Maintain fences	122	2	Ongoing			ADOT				
M3	Remove gravel pullout	123	2	1			ADOT				
M3	Manage off-road vehicle use	124	1	Ongoing			BLM NN				
M3	Monitor grazing	125	2	Ongoing			BLM NN				
M3	Develop an HMP for habitat on BLM-administered land	126	1	1	2	SE	BLM	5,000			

*Costs refer to USFWS expenditures only.
Task duration is in years.

PART III. IMPLEMENTATION SCHEDULE

GENERAL CATEGORY (1)	PLAN TASK (2)	TASK # (3)	PRIORITY # (4)	TASK DURATION (5)	RESPONSIBLE AGENCY FWS REGION (6)	RESPONSIBLE AGENCY FWS PROGRAM (6a)	RESPONSIBLE AGENCY OTHER (7)	FISCAL YEAR COSTS (EST.)* FY1 (8)	FY2	FY3	COMMENTS (9)
R2,R3	Study the ecology of P. bradvi	21	2	3	2	SE		20,000	5,000	5,000	
R1	Study the population biology	22	2	3	2	SE	BLM BIA NPS NN	20,000	5,000	5,000	
R6	Inventory for P. bradyi	23	2	3	2	SE	BLM BIA NPS NN	5,000	5,000	5,000	
R14	Develop a trade study	31	2	1	2	SE		20,000			
R1	Develop a monitoring study	32	2	Ongoing	2	SE		20,000	10,000	10,000	
R7	Determine the feasibilit of reducing collecting pressure by promoting artificial propagation program	33	2	1	2	SE		15,000			
02	Develop a Law Enforce-ment strategy plan	34	2	1	2	SE LE		2,000			

*Costs refer to USFWS expenditures only.
Task duration is in years.

PART III. IMPLEMENTATION SCHEDULE

GENERAL CATEGORY (1)	PLAN TASK (2)	TASK # (3)	PRIOR TY # (4)	TASK DURATION (5)	RESPONSIBLE AGENCY FWS REGION (6)	RESPONSIBLE AGENCY FWS PROGRAM (6a)	RESPONSIBLE AGENCY OTHER (7)	FISCAL YEAR COSTS (EST.)* FY83 (8)	FISCAL YEAR COSTS (EST.)* FY84	FISCAL YEAR COSTS (EST.)* FY85	COMMENTS (9)
01	Develop public awareness	4	3	Ongoing	2	SE		5,000	1,000	1,000	
R7	Develop propagation techniques	5	3	3	2	SE		10,000	5,000	5,000	

*Costs refer to USFWS expenditures only.
Task duration is in years.

APPENDIX

List of Reviewers

The first agency review draft of the Brady Pincushion Cactus Recovery Plan was sent to the following agencies for their review on January 27, 1984.

State Director, Bureau of Land Management, Phoenix, AZ
Division of Wildlife Research, U.S. Fish & Wildlife Service, Washington, D.C.
Regional Director, National Park Service, San Francisco, CA
Park Superintendent, Grand Canyon National Park, Grand Canyon, AZ
Program Manger, Navajo Game and Fish Department, Window Rock, AZ
Non-Game Branch Supervisor, Arizona Game & Fish Department, Phoenix, AZ
Bureau of Indian Affairs, Window Rock, AZ
Director, U.S. Fish and Wildlife Service (AFA), Washington, D.C.

A second agency review draft was sent to the following agencies for their review on October 16, 1984.

State Director, Bureau of Land Management, Phoenix, AZ
Mr. K. C. Newland, Boyce Thompson Southwest Arboretum, Superior, AZ
Mr. Larry Richards, Commission on Agriculture & Horticulture, Phoenix, AZ
Regional Director, National Park Service, San Francisco, CA
Park Superintendent, Grand Canyon National Park, Grand Canyon, AZ
Program Manager, Navajo Game & Fish Department, Window Rock, AZ
Bureau of Indian Affairs, Navajo Area Office, Window Rock, AZ
Administrator, Arizona Department of Transportation, Phoenix, AZ
Director, Arizona Nature Conservancy, Tucson, AZ
Ecological Services Field Office, U.S. Fish and Wildlife Service, Phoenix, AZ
Realty Division, U.S. Fish and Wildlife Service, Albuquerque, NM
Law Enforcement, U.S. Fish and Wildlife Service, Albuquerque, NM
Director, U.S. Fish and Wildlife Service (AFA), Washington, D.C.

Comments Received

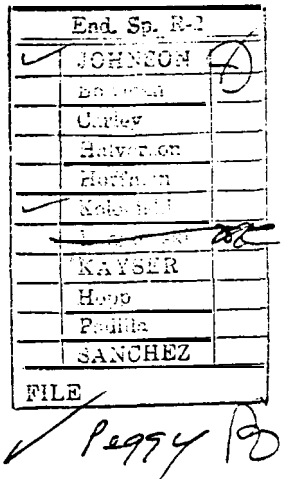
Letters of comment on this plan have been reproduced in this section, followed by an outline of the responses to each comment.

United States Department of the Interior

NATIONAL PARK SERVICE
WESTERN REGION
450 GOLDEN GATE AVENUE, BOX 36063
SAN FRANCISCO, CALIFORNIA 94102

IN REPLY REFER TO:
N1617(WR-RN)

March 16, 1984



Memorandum

To: Regional Director, Region 2, Fish and Wildlife Service, P.O. Box 1306, Albuquerque, New Mexico 87103

From: Regional Director, National Park Service, Western Region

Subject: Draft Recovery Plan Review for Pediocactus bradyi

Thank you for the opportunity to review the draft recovery plan for Pediocactus bradyi, Brady pincushion cactus. We are particularly interested in this listed endangered cactus because suitable habitat does exist for it within Grand Canyon National Park. We were pleased to read the recommendation in the plan for an inventory for P. bradyi. Suitable habitat on rims of Marble Canyon in Grand Canyon National Park should be included in this inventory.

Enclosed is the draft recovery plan. We are returning the plan so you can read our marginal comments. Major comments for your consideration are listed below:

A-1 Page 2. In the first sentence of the second paragraph there is a misnomer of the species. It is Brady pincushion cactus, not Brady plains cactus.

Page 7. Impacts and Threats. Seven activities were listed as impacts and threats: off-road vehicles, uranium mining, collection, stock grazing, highway
A-2 construction, land development, and natural factors. What is the priority order? Can the extent of impact and/or threat be estimated for each activity? Obviously, natural factors affect populations, but the factors do not seem to constitute an impact or threat. Rather they are influences to consider in conjunction with human activities.

Introductory and closing paragraphs would be helpful in this discussion of impacts and threats.

Page 10. Management and Conservation Efforts. On the bottom of page 11, a management recommendation appears to be given in the discussion of off-road vehicles regarding Bureau of Land Management designations and closures. Is this
A-3 intentional since no other recommendations are given for the other topics in this subsection? Also, more information about the range situations and grazing would be helpful, i.e., what is the current grazing practice, how many animals, how many ranchers involved, and What is the season of heaviest grazing? How is the range situation considered a management and/or conservation effort?

As a final comment, have law enforcement efforts been successful catching
A-4 cactus poachers? That would seem difficult in this remote area. By developing public awareness of Brady pincushion cactus as mentioned in the draft plan, would not the risk of illegal collecting increase?

We appreciate the opportunity to review the draft recovery plan. If you have questions on our review comments, contact Tom Gavin, Resources Management Division at FTS 556-8373.

Howard D. Chapman

Enclosure

JOHNSON	
Bowman	
Carley	
Halvorson	
Hoffman	
Kologiski	
Langowski	
KAYSER	
Hopp	
Padilla	
SANCHEZ	

45

UNITED STATES GOVERNMENT

memorandum

DATE: MAR -51984

REPLY TO ATTN OF: Acting Assistant Area Director

SUBJECT: Agency Review DRAFT Recovery Plan for Pediocactus bradyi

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CL 3-59

TO: Regional Director, U.S. Fish and Wildlife Service
Albuquerque, New Mexico

We have reviewed the subject draft and find it to be generally well written and organized. However, we offer the following comments for your consideration.

1. We agree with the recommended measures for "...enforcement of existing regulations" outlined on Pages 18 through 21 of the draft plan, especially
B-1 "No. 1.124 Manage off-road vehicle use" outlined on Page 20 of the text. We believe that lack of enforcement and off-road vehicles maybe the two main problems with regard to the loss of the subject cactus species.

2. We also support the recommended measure "No. 242 Search for new locations" outlined on Page 24 of the text. In this regard, we believe the draft plan
B-2 should clearly point out that the Navajo Reservation has never been intensively surveyed by a cactus expert for Pediocactus bradyi. Consequently, we would favor an intensive survey of the Navajo Nation for this subject cactus species. We propose that the U.S. Fish and Wildlife Service fund such a survey under Section 6 of the Endangered Species Act.

Thank you for the opportunity to review the draft plan and we hope these comments can be of some assistance to you and your organization.

FWS REG 2
RECEIVED
MAR 9 '84

MAR 8 1984

SE

OPTIONAL FORM NO. 10
(REV. 1-80)
GSA FPMR (41 CFR) 101-11.6
5010-114

☆U.S. Government Printing Office: 1980—341-526/6255

IN REPLY REFER TO:

46

United States Department of the Interior

4510 (932)

BUREAU OF LAND MANAGEMENT
ARIZONA STATE OFFICE
2400 Valley Bank Center
Phoenix, Arizona 85073

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CL-3-25

March 26, 1984

Memorandum

To: Regional Director, Region 2, U.S. Fish and Wildlife Service, Albuquerque, New Mexico

From: Deputy State Director, Lands and Renewable Resources, Arizona

Subject: Review of Draft Recovery Plans for Arizona Hedgehog Cactus and Brady Pincushion Cactus

We have reviewed the draft recovery plans for Echinocereus triglochidiatus var. arizonicus and Pediocactus bradyi. We offer the following comments and suggestions.

Arizona hedgehog cactus recovery plan

1. Pages 2 and 20 - Since the taxonomic status of this cactus has not been adequately resolved, additional morphological studies are advisable to more distinctly define character limits.

2. Page 15 - The propagation of Arizona hedgehog cactus for commercial distribution seems somewhat premature without a complete knowledge of existing population distributions and relative numbers. Although the narrative section addresses the need for a complete inventory, it is not clear whether such an inventory will be completed prior to the implementation of a propagation program. This should he clarified.

   One of the primary objectives is establishment of a wild population of 10,000 plants. It is unclear whether this population is to be made up of naturally occurring or reintroduced cultivated plants or a combination of both. This should be clarified. Naturally occurring populations should receive priority consideration in any recovery effort.

3. Pages 17 and 23 - Since populations of the cactus are not known to occur on public lands administered by BLM, it is inappropriate to identify BLM as being responsible for development of a management plan and associated land use management actions listed in Section 31. Reference to BLM involvement should be deleted.

MAR 30 1984

4. Fagr 20 - A more complete inventory is advisable to determine whether additional populations occur outside the known range.

5. Page 25 - The removal of specimens at the fringe of their suitable habitats to supplement low density populations elsewhere may be undesirable. Isolated populations at the periphery of their range should be crucial in gaining an understanding of taxonomic limits of E. t. var. nrizonicus.

Brady pincushion cactus recovery plan

1. Page 18 - The maintenance of fences along highway rights-of-way is generally the responsibility of thr State Transportation Department. Access through such fences is controlled by the Highway Department.
C-1 Access is usually provided at strategic points to provide access for several types of uses or needs. Restricting access and regulating users may be an extremely difficult task.

Such closures to off-roac! vehicles are difficult to administer and may cause more impacts on the populations than occasional cross-country travel presently does. Publ ic participation andan environmental assessment would be required for the closures. This draws public attention to the areas. As stated on page 10 of the plan, sites are purposefully kept vague to protect the species from collectors. It would he more advantageous to post access routes that travel should be restricted to existing roads and trails rather than drawing more attention to sites where P. bradyi are known to exist.

2. Page 19, item 113 - Although CFK 3809.2-2(d) requires mining claim operators to prevent any adverse impacts to Federally-listed threatened or endangered species, the Bureau's capability to enforce such regulations is extremely limited. The impression given by the
C-2 draft plan is that such enforcement could curtail or defer mining operations in areas where T&E species exist. Cased on existing regulations, mining claim operators are free to operate in a manner consistent with the mining laws of 1872 (17 Stat. 91). The Bureau's ability to enforce regulations which conflict with the mining laws is extremely limited; however, the Bureau can require stipulations in Mining Plans of Operation to mitigate for losses of T&E species habitat. Stipulations could also be developed which would modify proposed operations to lessen the loss of such habitat whenever practical..

3. Page 20, item 124 - This provision needs to be carefully evaluated due to the problems associated with ORV closures previously mentioned. In addition, we are not aware of any areas of BLPI-administered lands
c-3 which have been identified as "critical habitat" for the species. We would appreciate being informed, if such a designation has been made.

Items on pages 20 through 25 involving BLN-administered lands can best be addressed through the development of an interagency HMP. Once the
c-4 recovery plan is completed, it would be advisable for the FWS and BLM to develop such a plan. The plan would not only address the need for

further study and monitoring of the species, but would provide FWS the opportunity to coordinate on management decisions affecting the habitat and overall condition of the species on public Lands. In addition, such a plan must be prepared before reintroducing or transplanting species into naturally occurring populations on the public lands.

Thank you for the opportunity to comment on the draft recovery plan.

Acting

United States Department of the Interior

IN REPLY REFER TO:
4510 (023)

BUREAU OF LAND MANAGEMENT
Phoenix District Office
2015 West Deer Valley Road
Phoenix, Arizona 85027

February 29, 1984

Memorandum

To: Russell Kologiski, Endangered Species Botanist

From: Mary Butterwick, District Botanist

Subject: Agency Review Draft Recovery Plans

I have reviewed the draft recovery plans for Pediocactus bradvi and Echinocereus triglochidiatus var. arizonicus and would like to offer the following comments for consideration.

Echinocereus triglochidiatus var. arizonicus

Page 2, Paragraph 4, Sentence 3: This comment is inappropriate and serves no purpose in a recovery plan.

Page 3, Paragraph 1, Sentence 1: The use of the word 'naming' is inappropriate here. It is not necessary for the author to project his opinion of what the results of a morphological study would be.

Page 3, Florphology, Paragraph 1: The first sentence is poorly constructed.

Page 6, Paragraph 2: The Bureau of Land Management also administers land within a couple of miles east of the range indicated on the map.

Page 6, Habitat, Paragraph 1, Sentence 1: What is the difference between 'mixture of' and 'ecotone between'? Does the Latter phrase further describe the former phrase?

sentence 3: The use of 'or' implies that 'open slopes' and 'understory of a more open canopy' are mutually exclusive items.

Page 6, Habitat, Paragraph 2, Line 3: The use of 'here and there' is awkward.

Line 4: Do ledges and flat spots necessarily provide stability? The sentence structure is poor (note the dangling participle at the end).

Page 7, Table Two: Andropogon barbinodis Lag. is now generally considered in Bothriochloa barbinodis (Lag.) Herter. Antirrihinum is spelled Antirrhinum; Carpochaete is spelled Carphochaete.

Page 8, Faragraph 2, Line 1: Miami should be upper-case.

Page 8, Paragraph 2, Sentence 2: Do sightings of E. t. var. arizonicus near Miami decrease because of a change in substrate or because of surface disturbance? The Arizona Bureau of Mines geologic map of Gila County shows granite within a mile of Miami.

Page 11, Paragraph 2, Sentence 4: What is the point of this comparison? Is the collection of E. t. var. arizonicus not a problem? In paragraph 1 the author states that the effect of collection on long-term survival is not presently known.

Page 12, Paragraph 1, Line 10: 'withdrawl' should be 'withdrawal'.

Page 13, Paragraph 1, last sentence: It is unclear what the author means by 'recovery goals may have to be raised'.

Page 13, Management and Research Efforts: Was the study exclosure funded in FY 83 constructed?

Page 14: Is the 'stable wild population' of 10,000 individuals comprised of propagated plants? Reintroductions are mentioned on page 13. The use of the word 'established' indicates considerable human involvement. 'Maintain' might be a better choice of words.

Nat&-ally occurring populations should receive priority for a difficult management action such as mineral withdrawal.

Page 16, 1. 11. 111.: Collection of seed should be restricted to propagation efforts directly involved in recovery of the species. As stated, it sounds as though any collection is alright as long as the seed are used for propagation purposes.

Page 16, 1. 13.: Only areas not covered by valid mining claims can be withdrawn from operation of the mining laws.

Page 16, 2. 22.: Use the word 'among' rather than 'between'. Omit the word 'nearby'.

Page 21, 23. 233.: Why should the fact that the amount of grass cover and freeze loss are not correlated make a difference in the number of plants desired prior to downlisting? I do not comprehend the logic here.

Page 34, 4. 42.: Again, is the wild population of 10,000 individuals made up of naturally occurring or reintroduced cultivated plants or a combination of both'?

I do not agree with the suggestion of reintroducing cultivated specimens to existing natural populations. Such an action would alter the genetic structure of the population and may result in long-term effects that are not beneficial to the maintenance of the taxon.

Page 25, 4. 42.: I do not see how removing specimens at the fringe of suitable habitat and relocating the plants elsewhere will aid in the recovery of the species. This level of population manipulation is inappropriate. The isolated specimens at the periphery of the range must be considered in defining the taxonomic limits of E. t. var. arizonicus.

Pediocactus bradyi

D 1 Page 2, Paragraph 2, Line 8: Replace 'Next the budget' with 'The implementation schedule'.

D-2 Page 3, Paragraph 2, Line 3: 'Radical' should be 'radial'.

D-3 Page 4, Paragraph 1, Line 5: Use the present tense.

D-4 Page 7, Impacts and Threats, Line 8: Substitute the words 'crushing' for 'smashing' and 'damaging' for 'damage'.

D-5 Page 11, Off-Road vehicle designation, Paragraph 2, Line 3: Substitute the word 'find' with 'fund'.

D-6 Page 13, Propagation, Paragraph 1, Line 1: Substitute the word 'had' with 'has'.

D-7 Page 13, Propagation, Paragraph 2, Line 1: Omit the word 'had' and omit the last portion of this sentence beginning with 'however'.

D-8 Page 13, Propagation, Paragraph 2, after sentence 3 insert the following: BLM funding for this research project was not continued and a complete system for the tissue culture propagation of P. bradyi has not been developed.

D-9 Page 13, Propagation, Paragraph 2, Line 6: 'Institution' should be plural and 'had' should be 'have'.

Page 15, step-down outline

D-10 1. 11. 113.: How about withdrawal of area from operation of the mining laws?

D-11 Page 18, Narrative, 1.: Should read '. . .management of the habitat for the protection of the species'.

Page 19, 12. 121.: Substitute sentence 2 with: Agriculture and
D-12 iiorticulture signs state that the Cactaceae are protected in the state and that violators are fined. These informative signs might deter some potential collectors.

D-13 Page 20, 124. 1241.: Omit the word 'critical'.

D-14 Page 20, 125.: How about an exclosure?

D-15 Page 22, 22., Line 1: 'characterists' should be 'characteristics'.

D-16 Page 23, 222., Sentence 2: Overlying should be upper-case.

Page 24, 233: It might be more appropriate to establish an HMP for
D-17 the area before the life history and demographic studies are completed.

Thank you for the opportunity to comment on these draft recovery plans. If you have questions, please contact me at (602) 863-4464.

53

ARIZONA GAME & FISH DEPARTMENT

2222 West Greenway Road Phoenix, Arizona 85023 SA 942-3000

JOHNSON
Bowman
Carley
Halverson
Hoffman
✓ Kologiski
Langowski
KAYSER
Padilla
FILE

March 19, 1984

1994 PD

Russell Kologiski
Endangered Species Office
U. S. Fish and Wildlife Service
P. 0. Box 1306
Albuquerque, New Mexico 87103

Dear Rusty:

I have reviewed the Echinocereus triglochidiatus var. arizonicus and Pediocactus bradyi recovery plans and prepared the following comments.

In previous correspondence I stated that my principle concern with the Echinocereus triglochidiatus var. arizonicus recovery plan is with the appropriateness of listing the species and not so much with the plan itself. The taxon is merely one of many forms of a widespread species (I question whether it even deserves varietal status). The threats which have been mentioned are, at best, minor, it is locally common and many more plants no doubt await discovery. In reading the plan it is obvious that almost nothing is known about the taxon. The total number of plants (an important figure) is crudely estimated at from 1,500 to over 14,000 plants. In the step-down it is recommended to control javelina populations within the identified range and yet it is also stated that javelina have never been recorded to utilize the species. Acquisitions are recommended and many other management recommendations -are given, all of these in near total absence of any but the most subjective supporting data. This is not the fault of the recovery plan author. The format and function of the recovery plan are at odds with our real needs. We need to be asking and answering questions which should have been resolved before the taxon was listed; i.e., is the taxon valid, is it really threatened or endangered, if so what are the threats and how much does each contribute to its problems? The recovery plan as it is written attempts to make management recommendations premised on data which has not yet been obtained.

I assume it! would be difficult to accomodate my concerns within the existing proceedural framework.

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My chief concerns are: (1) the plan should be cognizant of the lack of information on the taxon and make recommendations accordingly so managers are not compelled to make biologically unnecessary decisions; and (2) that already sparse funds are not expended managing a plant with a real biological priority which is probably much lower than the many other obscure but critically endangered plants. In the interests of maintaining the integrity of the Endangered Species Act extra care should always be taken to justify actions.

With regard to the Pediocactus bradyi recovery plan I have no doubt that it is genuinely endangered
E-1 and in need of recovery. The plan appears to be well written and clear. Little is known about Pediocactus bradyi although considerably more than is known about Echinocereus triglochidiatus var arizonicus and substantial threats have been demonstrated. The recovery plan adequately addresses this. The step-down recommendations are reasonable and should be effective.

Sincerely,

Bud Bristow, Director

Frank W. Reichenbacher
Nongame Habitat Specialist

cc: Don Turner, Levi Packard

United States Department of the Interior

NATIONAL PARK SERVICE
WESTERN REGION
450 GOLDEN GATE AVENUE. BOX 36063
SAN FRANCISCO, CALIFORNIA 94102

IN REPLY REFER TO:

N1621 (WR-RN)

December 10, 1984

Memorandum

To: Regional Director, Region 2, Fish and Wildlife Service, Albuquerque, New Mexico (AFF)

From: ACTING Regional Director, Western Region, National Park Service

Subject: Agency Review Draft for Brady Pincushion cactus (Pediocactus bradyi)

Thank you for the opportunity to review the draft recovery plan. We certainly agree the need and strategy for protecting this endangered species, particularly on lands where it is impacted by grazing and ORV use. We support enforcement of existing regulations that provide protection, as well as appropriate management actions for enforcement.

We agree with parts of the Implementation Schedule (pages 38-40) that call for enforcement of existing collecting and trade regulations by agencies
F-1 involved, including this agency. In Grand Canyon National Park, we realize the need to inventory suitable habitat for this plant on the rim area of Marble Canyon. Depending on results from that inventory, we woulddetermine the need to develop management strategies to mitigate impacts from such activities as grazing, ORV use and illegal collecting.

The Nature Conservancy
Navajo Natural Heritage Program
P.O. Box 2429
Window Rock, AZ 86515

21 January 1985

Peggy Olwell
USFWS Office of Endangered Species
P.O. Box 1306
Albuquerque, NM 87103

Dear Peggy:

I have reviewed the draft recovery plan for Pediocatus bradyi and find it satisfactory. The following comments are on Part III: Implementation Schedule.

The Navajo Tribe should be included as a responsible agency since Pediocatus'bradyi occurs on our lands. Include the Navajo Nation in the following pages and tasks:

G-l	page 38 - 02 - task #112
G-2	" - 02 - task P113
G-3	" - M3 - task 1124
G-4	" - M3 - task #125
G-5	page 39 - Rl - task #22
G-6	" - R6 - task #23
G-7	" - Rl - task #32

This recovery plan is a good example of why Indian Tribes should be included for ESA Section 6 funds. E/T species occur on our lands and if eligible for funds the Indian Tribes can adequately implement the recovery plan recomendations. I think the Fish and Wildlife Service, in conjunction with Indian Tribes, should initiate discussions to include Indian Tribes as eligible recipients for ESA Section 6 funds.

Thank you for the opportunity to comment on this recovery plan. I hope to be included with the Navajo Nation in future comments concerning Endangered and Threatened species on the Navajo Nation and surrounding lands.

Sincerely,

Donna E. House
Botanist

IN REPLY REFER TO:

4510 (932)

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
ARIZONA STATE OFFICE
3707 N. 7th Street
Phoenix, Arizona 85014

RD
DRD
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PAO
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CL-1-139

January 15, 1985

Memorandum

To: Regional Director, Region 2, Fish & Wildlife Service, Albuquerque, NM

From: State Director, Arizona

Subject: Draft Recovery Plans for Brady Pincushion and Arizona Hedgehog Cactus

We have reviewed the draft Recovery Plans for ~~Pediocactus~~ bradyi and E. triglochidiatus var. arizonicus and provide the attached comment.

Associate

Attachment

I. General Comments on Arizona Hedgehog Recovery Plan

It would seem that the development of a recovery plan for E. triglochidiatus var. arizonicus is somewhat premature. Since the taxonomic status of the species has not been resolved and population numbers among arizonicus, melanacanthus and neomexicanus can vary from 1,500 to 14,000 individuals, a recovery plan for a specific unknown variety is somewhat inappropriate.

The primary objective of the recovery plan is to maintain a population of 10,000 individuals, permitting the downlisting of the species. However, the draft plan states that so little is known about the populations that we may well have 10,000 individuals in existence. We feel that steps should be taken to first determine the taxonomic status of the species and then identify known populations and numbers, prior to developing a recovery plan which has no definable population.

Specific Comments

Pg. 8, second paragraph: The decrease in sightings from nonmineralized areas toward mineralized areas needs to be clarified. What is the correlation between mineralized and nonmineralized sites? It would appear, based on the preceding information, to be a natural limitation of the species caused by a change in soil pH.

Pg. 11. Collection: The rationale supporting the theory of collection appears to be subjective, rather than supported by fact. Since it is not possible to distinguish var. arizonicus from similar species,.it seems a comparison would be extremely difficult. How do reported collections on page 11 support the theory of collection? It would seem, based upon the paragraph, that collecting may or may not have an impact upon the species.

Pg. 13. Predation: It is not clear what the statement between javelina and hedgehog cactus implies. However, it should be noted that javelina use in the area has occurred probably as long as the plants have been there. If there were to be any impact on var. arizonicus by javelina, surely it would have occurred prior to current time periods.

Pg.13. Freeze Loss: There are no studies to indicate livestock use has significantly reduced grasses in and around cacti and whether there is a correlation between livestock use of grasses and freezing of cacti. It should also be noted that an increase in grass cover may insulate cacti but it will also increase the possibility of wildfire which could eliminate a population.

Pg. 15, last paragraph: The statement concerning stable populations needs to be clarified. If the current estimated population is 1,500-14,000 individuals (Page 9), then it seems the goal of 10,000 individuals for downlisting has been achieved.

Pg. 16. Prime Objective: The present estimated population should be redefined in view of the prime objective to establish a population of 10,000 plants.

Pg. 22. 1221, Ensuring Grazing Systems are Compatible: It is not clear how the use of exclosures would determine if livestock management systems are compatible with seedling establishment. There appears to be several unknowns affecting seedling establishment, one of which may be livestock use of vegetation. It would also seem that freezing which has had a documented impact upon population success needs further monitoring. It would seem more appropriate to monitor vegetative cover in relation to reproductive success, rather than an unknown parameter which may or may not have an impact upon the species.

Pg. 30, 4. Investigate Propagation Techniques and Reintroduction Methods: We question the value and necessity of such a proposal. Based upon the information provided in the draft plan, it appears the amount of collection, if any, is unknown at this time. It is also stated that, due to its similarity to several more common species, its desirability for collection is greatly lessened (Page 11). We also feel seed collection for the purpose of reintroduction would further impact the natural success of reproduction. This collection would build into all on-going studies a false level of population trends and overall habitat suitability. The removal of natural seed sources from the habitat area. would surely limit the species ability to recover, especially in light of management actions proposed for the area. So many variables are involved with recovery of the cactus that entering into a reintroduction could complicate measurements of success with other management actions.

Pg. 35. Implementation Schedule: The implementation schedule appears to be missing some actions such as A5 (withdrawal) and M2 (reintroduction), which were mentioned in the recovery section.

Summary

A major issue within the plan is an undefinable population. Without this, it is not possible to establish a realistic monitoring plan. A clarified method needs to be presented to show how and when the FWS will determine estimated numbers have been reached. It would be extremely valuable to land management agencies if this methodology could be scientifically defensible.

II. General Comments on Brady Pincushion Cactus

H-1 It would appear most of the impacts and concerns raised by FWS over the type of management are at best speculative. There seem to be several natural factors which have been documented as having significant impacts upon the population of P. bradyi. Regardless of the land management decisions which could be enacted, such natural factors as change in soil conditions, projected increased moisture, and seasonal freezing and thawing would continue to decimate the population. Such factors have only been briefly discussed in this plan, while an extensive amount of effort has been spent on trying to substantiate significant man-caused impacts with very little data.

Specific Comments

Pg. 1. Introduction: Based upon information provided in this plan and data collected by Bureau botanists, the potential for P. bradyi to be lost from this site regardless of management actions is still very

H-2 high. Recent field observations of these habitat sites indicate no recent sign of collection even in easily accessible areas (Hughes 1983). It should also be noted that past inventories of the species. habitat by qualified botanists indicated an extreme lack of data which made it impossible to determine if indeed there has been a marked reduction in population numbers (Gierisch 1980).

Pg. 8-11. Impacts and Threats: Many of the statements made in this section appear to be rather subjective. It would be beneficial and

H-3 provide support to FWS claims if incidents of collecting were documented and known occurrences of ORV destruction were identified.

Pg. 9. There are two significant factors presented here which need further clarification. The collection and noted damage need to be discussed in greater detail. Is this occurring in the field by illegal

H-4 collection or through applied research? To what extent and in what locations have these occurred? It is extremely interesting that the narrative portion of the recovery plan identifies known occurrence of abundant populations of herbivores in and around specific populations (pages 28-29) yet there is no discussion of predation as an impact upon the species. It would appear as though the FWS may have been selective in the types of impacts necessary to address.

The statement concerning ORV damage to cactus, we believe, appears to be somewhat erroneous. Although there may be isolated incidences of damage

H-5 caused by ORV use, we have also documented regeneration and reproduction of P. bradyi in old ORV tracts (Hughes). Therefore, the statement referring to habitat destruction should be removed since it cannot be substantiated.

Pg. 10. The statements concerning uranium exploration and mining need to be clarified. It would appear, based upon the information provided, that exploration is occurring near or adjacent to suitable habitat. However, the section states that P. bradyi habitat lies directly above potential uranium deposits. The statement does not state whether
H-6 exploration has occurred or applications have been filed on habitat occupied by P. bradyi. Since the majority of land considered valuable for uranium exploration has already been filed for or previously explored, and there is no documented incidents of species habitat being affected, it would be safe to say that the potential for effect through this type of action is very low.

We question the statement concerning livestock trampling. Since 1980 transects for monitoring.:. bradyi within existing allotments have yet
H-7 to document a single definable loss of P. bradyi directly attributable, to livestock trampling. However, several individuals have been found along transects uprooted or raised well above the surface which appears to be caused by melted frost (Gierisch 1980, 1981, 1982; Hughes 1983, 1984).

Pgs. 13-16. Range Situations: Following the Vermillion Grazing EIS,
H-8 opportunities came about which would allow grazing use to be changed from yearlong to seasonal (October-May) which is felt to be a great improvement over present and historical use.

H-9 Soap Creek - The' South Soap pasture will be rested every year for the period July 1 through November 15 and deferred on alternate years, which actually allows a full year's rest every two years, giving a continuous growing season rest March 15 through September 30 every other year.

Cram - The Cram Allotment will in effect be rested June 15 through
H-10 October 31 each year. The AMP allows the operator to keep up to 13 cattle during the summer period in the schedule use pasture. This system provides two growing season rests March 15 through September 30 every three years, one of which continues for one year.

Buffalo Tank - The Buffalo Tank Allotment will have basically the
H-11 same system as the Cram; however, up to 40 head of cattle may use the scheduled use pasture through the summer-fall, June 15 through November 30. The Buffalo pasture will receive two growing season rests every three years, one of which continues that rest for one full year.

The statement on Page 16 that the only change in range use the AMPs will bring about is distribution of cattle is incorrect as can be seen by the above discussion. There are very substantial changes, both in numbers of total livestock authorized, and in season of use, not to mention the
H-12 added rest which will be provided on a regular systematic basis. In fact, the overall use measured in cow days use per acre in the highest stocked pasture (which will occur in the spring period) will actually decrease from pre-1980 use. The following is an example of change in stocking density in the Cram Allotment which now includes the Sand Pasture.

Sand Pasture (after AMP) = 6,630 acres - 300 cattle 3/15 to 5/30
Cow day use per acre = 3.39

Cram Allotment (pre-1980) = 23,920 acres - 291 CYL
Cow day use per acre = 4.4

Therefore, if pre-1980 grazing has been a negative impact on P. bradyi, the proposed grazing systems should be a positive effect on P. bradyi and its habitat.

H-13 Pg. 14. The last paragraph should include a statement ". . . proposed range improvements will be located in such a manner as to avoid P. bradyi and its habitat . . ." It is the policy of the Bureau, as well as a requirement through NEPA, to review all proposed project sites for T&E species occurrence, cultural sites, etc., prior to any construction and the completion of an environmental assessment.

H-14 Pg. 15. The statement in the first paragraph regarding the Vermillion EIS and a proposed catchment should be deleted. The project has been dropped as it was not included in the AMP. Also, the existing reservoir located in the immediate vicinity of two P. bradyi populations was constructed over 30 years ago. The presence of P. bradyi in this location indicates its persistence during previous heavier grazing pressures. It should be noted that, following the Vermillion Grazing EIS, the authorized grazing use was reduced from 326 CYL to 169 CYL in the Cram Allotment.

H-15 Pgs. 16-17. Monitoring: The statement concerning BLM monitoring efforts is erroneous and should be removed. The Bureau, particularly in the area of federally-listed species, makes a concerted effort to collect data whenever possible and document such collections in District files. This data is often used and referenced in the formulation of management decisions. Although not commonly published, the data is collected and available for analysis. During November, 1984, Arizona State Office received a copy of the Arizona Strip's monitoring efforts for P. bradyi during 1983 and 1984. Not only were historic transects read but new transects were added to the monitoring sites. The monitoring also indicates a continual collection of data for P. bradyi through 1987. ,

H-16 Pg. 26. 1241 Signing: Placing ORV and horticulture/agriculture signs along roadsides may not deter dedicated collectors and ORV enthusiasts. The possibility exists that such signs may well draw further unwanted attention to such areas

H-17 Pg. 30. 23. Inventory: It appears that population inventories are needed to arrive at total population estimates. Based upon information provided in this report, a great deal of scientifically defensible data and monitoring techniques need to be applied in order to arrive at population estimates for tracking progress to goals (Page 19).

Pg. 32. 33. Collection: This section needs further clarification. It
H-18 is doubtful if future recovery action would do much toward the recovery of the species if collection cannot be eliminated. If the problem is as paramount as the draft plan indicates, then any other actions may well be futile.

Pg. 33. 5. Propagation: Reintroduction of propogated cacti should be
H-19 used as a last resort. It should not be attempted until after other management actions have been implemented and monitored to determine if populations are recovering naturally.

Summary.

It appears the problems identified with ORV, uranium exploration, grazing and collection have not been adequately supported by substantive data. It would appear that the key to recovery of the species lies within a reliable monitoring system which will identify change and causes. There appears to be too many unknowns to provide any positive and meaningful resource commitments without knowing what benefits will be derived.

Replies to Comments

A-1 Corrected.

A-2 The extent of impact for each activity has not been quantified and therefore the order of severity of these threats to the species can only be assessed using rough estimates. The major threats to the species are collection and habitat destruction.

The suggestion was incorporated.

A-3 The recommendation to erect signs for ORV users was intentional because the habitat in this area is being damaged by ORV use.

The section discussing the range situation was expanded as suggested.

A-4 Law enforcement is difficult in this remote area and, to our knowledge, no apprehension of cactus poachers has occurred.

In developing a public awareness program of *P. bradyi*, specific locations will not be identified nor discussed.

B-1 Comments noted.

B-2 Comments were incorporated; however, Section 6 funds are not available to Indian reservations.

C-1 Comments were incorporated.

c-2 It is the Bureau of Land Management's responsibility not to violate Section 7 (a)(2) of the Endangered Species Act (ESA). The Service did not intend to give the impression that enforcement of CFR 3809.2-2(d) would curtail mining operations just because threatened and endangered species exist in claims area. However, if there is a violation to Section 7 (a)(2) of the Act, mining operations could be curtailed. It should be noted that the ESA does not allow for mitigation.

c-3 Suggestion was incorporated. Critical habitat designation has not been made for this species because of the threat from overcollection.

c-4 Suggestion was incorporated.

D-1 Suggestion was incorporated.

D-2 Corrected.

D-3 Corrected.

D-4 Suggestion was incorporated.

D-5 Corrected.

D-6 Corrected.

D-7 Corrected.

D-8 Suggestion was incorporated.

D-g Corrected.

D-10 This can be addressed in an HMP which would further study and monitor the species and provide coordination between BLM and FWS on management decisions affecting the habitat.

D-11 Suggestion was incorporated.

D-12 Suggestion was incorporated.

D-13 Corrected.

D-14 Suggestion was incorporated under Task 222.

D-15 Corrected.

D-16 Corrected.

D-17 Suggestion was incorporated.

E-l Information was noted.

F-l Information was noted.

G-l Suggestion was incorporated.

G-2 Suggestion was incorporated.

G-3 Suggestion was incorporated.

G-4 Suggestion was incorporated.

G-5 Suggestion was incorporated.

G-6 Suggestion was incorporated.

G-7 The development of a cactus trade management plan will be conducted on a national basis for all cactus species and is the responsibility of the FWS. It is not known at this time which species will be monitored to determine trade impact. If P. bradyi is selected, the Navajo Nation will be informed and FWS will work with the Navajo in setting up monitoring plots.

H-l It was not stated, nor has it been documented, that the natural factors are having significant impacts upon the population of P. bradyi. However, it was stated that these factors, in conjunction

with the human activities, make the species more vulnerable to the man-caused impacts and threats. The natural factors, such as seasonal freezing and thawing and increased moisture were discussed only briefly because these are natural processes that we cannot control with management while man-caused impacts can be controlled through sound management practices,

H-2 The information provided in this plan does not indicate that the potential loss of P. bradyi is high regardless of management actions. In fact, the plan provides for actions which will recover the species.

H-3 Incidents of collecting and damage to habitat and plants from ORV use have been documented by Clay May who has been monitoring P. bradyi annually since 1979. The locations of these impacts will not be provided in this plan because of the collecting threats. This data is available to BLM upon request.

H-4 The collection is occurring in the field by illegal collection, as stated in the plan, not by applied research. As discussed under H-3, localities will not be given in the plan due to the collection threat.

No damage to the plants due to predation has ever been reported or observed; therefore, it was not discussed as having an impact upon the species.

The FWS was not selective in the impacts it addressed; the threats were identified by the authors of the plan from the FWS funded status report and from Clay May's unpublished monitoring reports. The plan includes all factors presently known to threaten this species.

H-5 The fact that BLM observed P. bradyi in ORV tracks indicates that there is a problem. Therefore, the statement remains as is. Habitat destruction by ORV use has also been substantiated by Clay May.

H-6 The BLM may not have received a notice of intent or a mining plan of operation for any claim on P. bradyi habitat, but the fact that there are claims filed within this area indicates interest in mineral development. And the Service views this as a viable potential threat.

H-7 The BLM transects established in 1980 had not been reread until 1984, at which time only one complete 100-foot transect was relocated. Therefore, it is reasonable that no single defineable loss to P. bradyi attributable to livestock trampling has been documented.

It is the intention of this recovery plan to conduct studies to quantify what the threats are to the species. The threat from

livestock trampling is addressed as a potential threat until studies, such as those under Tasks 125 and 222, are completed to determine what the impact on the cactus is from livestock trampling.

H-8 From the range management point of view the change in grazing from yearlong to seasonal (October-May) would be viewed as a great improvement over historical use; however, this is also the period when P. bradyi is emergent and most vulnerable to livestock trampling. Therefore, this new grazing regime is scheduled for the most critical time of year for P. bradyi and is not beneficial to the species.

H-g The change has been made to indicate full year's rest every 2 years.

H-10 Information is the same as that stated in the plan, except that BLM comments indicate when the pasture is rested and the recovery plan indicates when pasture is in use which is more crucial to the plant.

H-11 See H-10.

H-12 The paragraph was deleted. It cannot be assumed that because the proposed grazing system decreases the overall use of pastures that this system will have a positive effect on P. bradyi. The most that can be said is that it may have a less negative effect on P. bradyi.

H-13 Suggestion was incorporated.

H-14 Statement was deleted.

H-15 The statement has been changed to incorporate the new monitoring information. The data was not available at the time the plan was drafted.

H-16 There is the possibility that these signs may not deter dedicated collectors and ORV enthusiasts; however, these signs may deter law abiding casual collectors and ORV users who are unaware of the laws. The signs will not state the presence of the cactus, and with proper enforcement, should be of positive impact to the cactus and its habitat.

H-17 As stated in the recovery plan, inventorying and monitoring are two major tasks intended to be accomplished through this plan.

H-18 It is the intention of the Service and this recovery plan to eliminate the illegal collecting as much as possible. A cactus trade management plan (CTMP) for all listed cacti will be developed by FWS. This CTMP will include a study to determine the feasibility of reducing the collecting pressure on the wild

populations by promoting a commercial artificial propagation program. Also included in the CTMP is the development of law enforcement strategies to address the collecting threat.

H-19 Captive breeding and reintroduction are commonly used techniques in the recovery of endangered species. The whooping crane is an example of the success of this method. Proper precautions will be exercised if reintroduction of propagated cacti is necessary for the recovery of *P. bradyi*.